



California Environmental Protection Agency
Department of Pesticide Regulation

Pesticides, Volatile Organic Compounds, and Ozone

Randy Segawa

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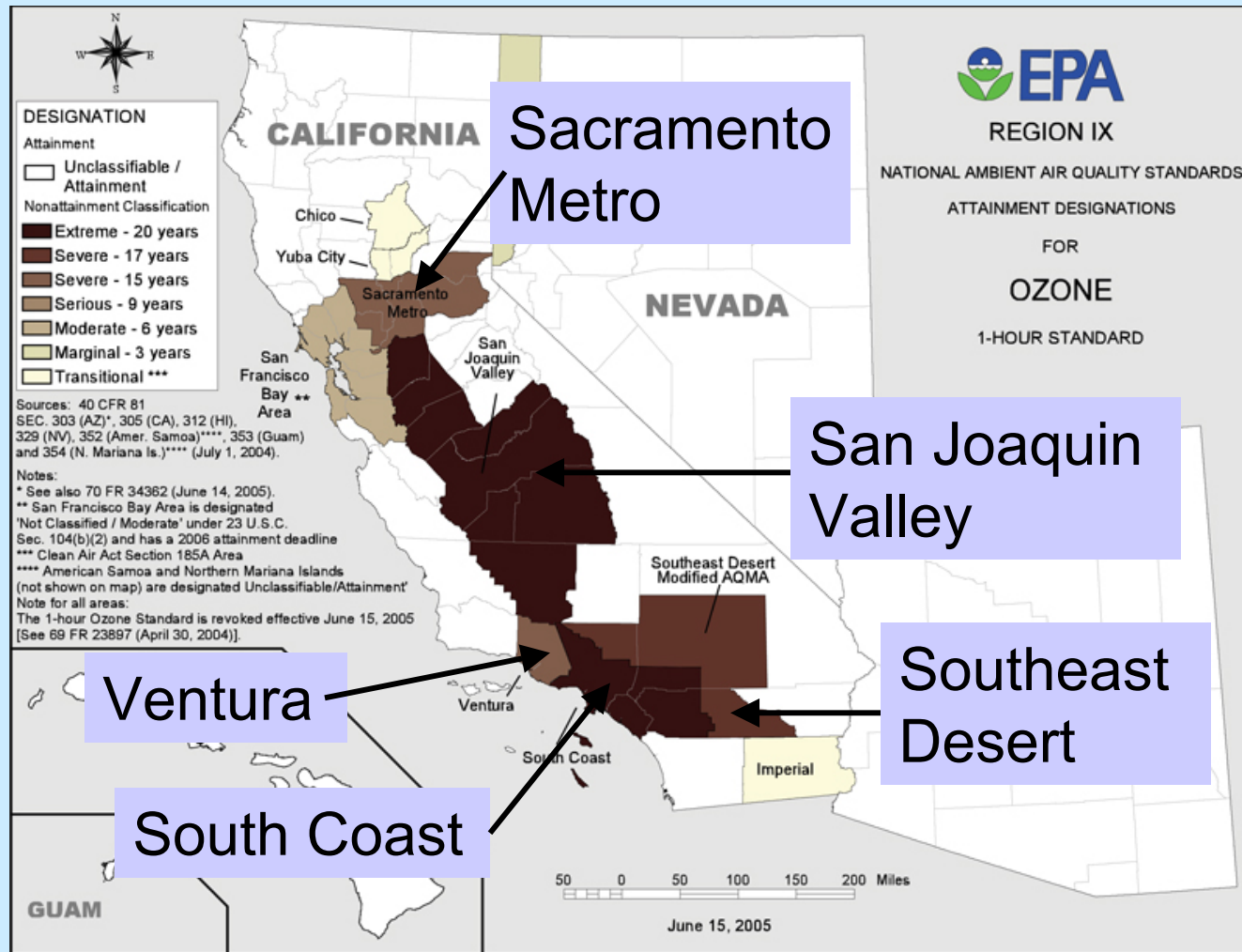
Overview

- Background
- Pesticide VOC Emission Inventory
- Department Actions: Air Quality Initiative
 - Fumigants
 - Emulsifiable Concentrates
 - Pest Management
 - Innovative Technologies

Background

- Volatile organic compounds (VOCs) and nitrogen oxides (NOx) react with sunlight to form ozone, a major air pollutant
- Many pesticide active and inert ingredients are VOCs
- As required by the Clean Air Act, Air Resources Board (ARB) and Air Pollution Control Districts (APCD) develop **State Implementation Plans (SIPs)** to reduce VOCs and NOx
- SIP requires the state to track VOC and NOx emissions, and reduce them by specified amounts in **nonattainment areas**

Ozone Nonattainment Areas For Federal 1-Hour Standard



1994 SIP DPR Requirements

- Develop and maintain an inventory to track pesticide VOC emissions
- Implement regulations to achieve 20% reduction in five nonattainment areas (per court order)

Major Sources of VOCs (San Joaquin Valley)

Category	% of 2005 Emissions
LIGHT DUTY PASSENGER CARS	16.0
PRESCRIBED BURNING	11.7
LIVESTOCK WASTE (DAIRY CATTLE)	9.5
OIL AND GAS PRODUCTION	6.8
CONSUMER PRODUCTS	6.2
PESTICIDES	5.8
COATINGS (PAINTS AND THINNERS)	2.9
FOOD AND AG PROCESSING	2.8

Method for Estimating VOCs, NOx, and Ozone

- DPR estimates VOCs for pesticides
- ARB estimates VOC and NOx emissions for other sources
- ARB uses computer modeling to estimate ozone concentrations based on VOC and NOx emissions
- ARB verifies and adjusts modeling based on ozone air monitoring data

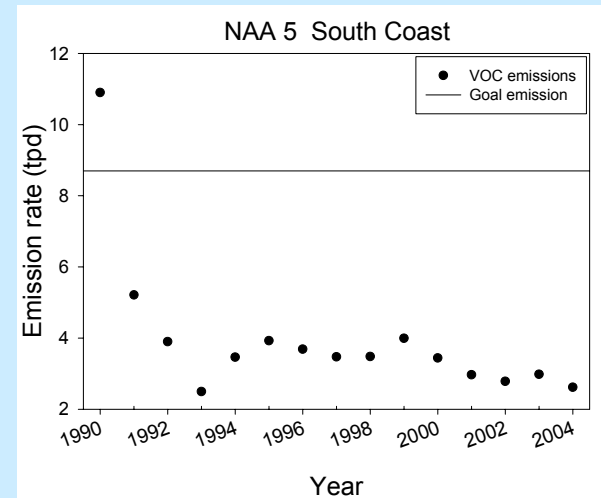
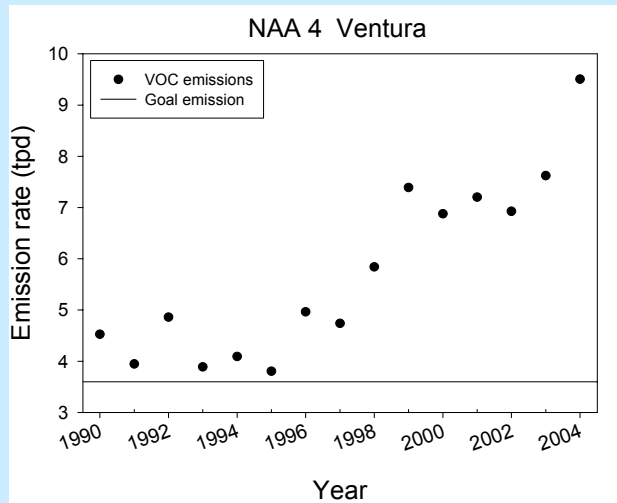
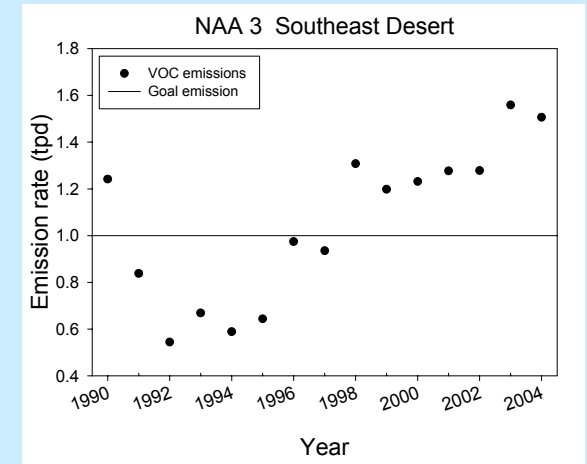
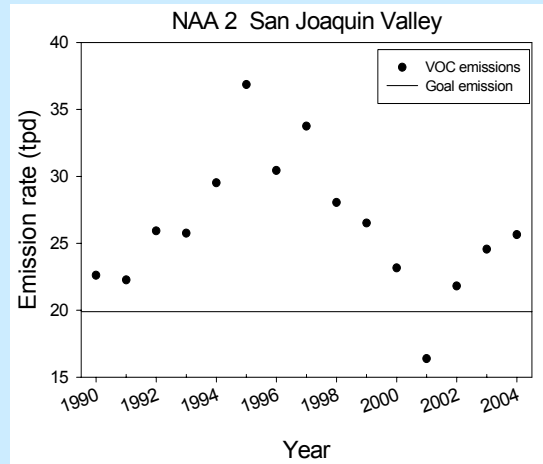
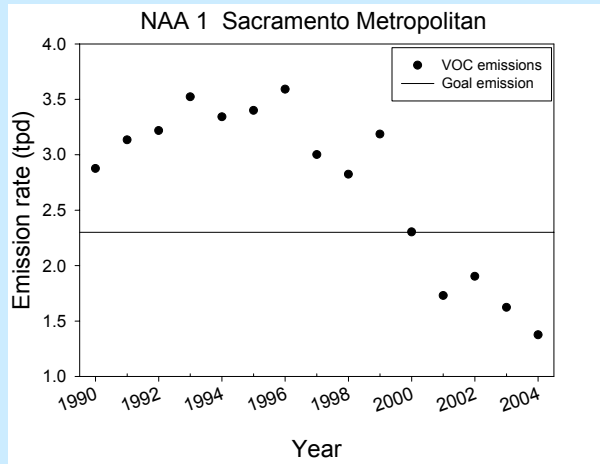
Method for Estimating Pesticide VOCs

- DPR maintains an inventory of VOC emissions from agricultural and commercial structural applications of pesticide **products**
- VOC emission from a pesticide product is:
emission = amount of product x VOC fraction in product
 - *Amount of product* determined from pesticide use reports
 - *VOC fraction* (**emission potential**) determined by:
 - Lab test (thermogravimetric analysis, TGA)
 - Water/inorganic subtraction
 - Confidential statement of formula
 - Default value

Emission Inventory Calculations

- DPR compiles an **emission inventory** of ag and commercial structural applications using emission potential and pesticide use data
- DPR calculates emissions for each year beginning with base year
- DPR updates each year of inventory annually based on most recent data
- Inventory focuses on:
 - May – Oct (peak ozone period) for each year
 - 5 nonattainment areas

1990 - 2004 May - October Pesticide VOC Emissions



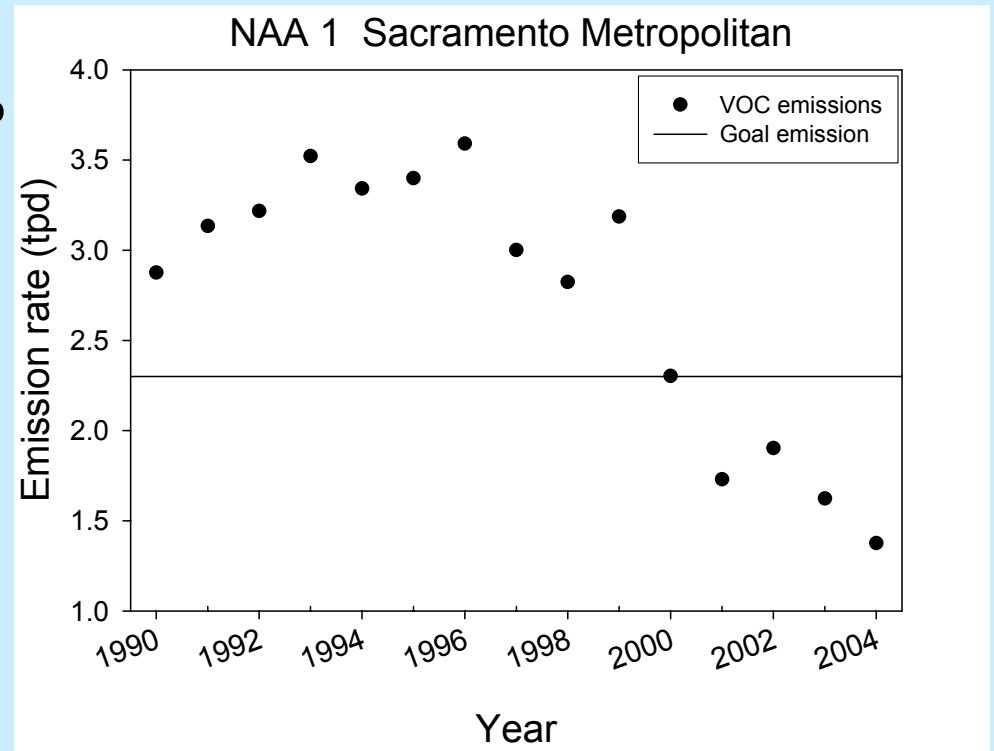
2004 Pesticide VOC Emissions in Sacramento Metro Nonattainment Area

- Top “Primary” Active Ingredients (% of emissions)

- Molinate (Ordram): 14%
- Chlorpyrifos (Lorsban): 8%
- Thiobencarb (Bolero): 7%
- 1,3-D (Telone): 7%
- Methyl bromide: 5%

- Top Application Sites

- Rice: 28%
- Walnuts: 13%
- Structural pest control: 9%
- Tomatoes: 9%
- Rights of way: 7%



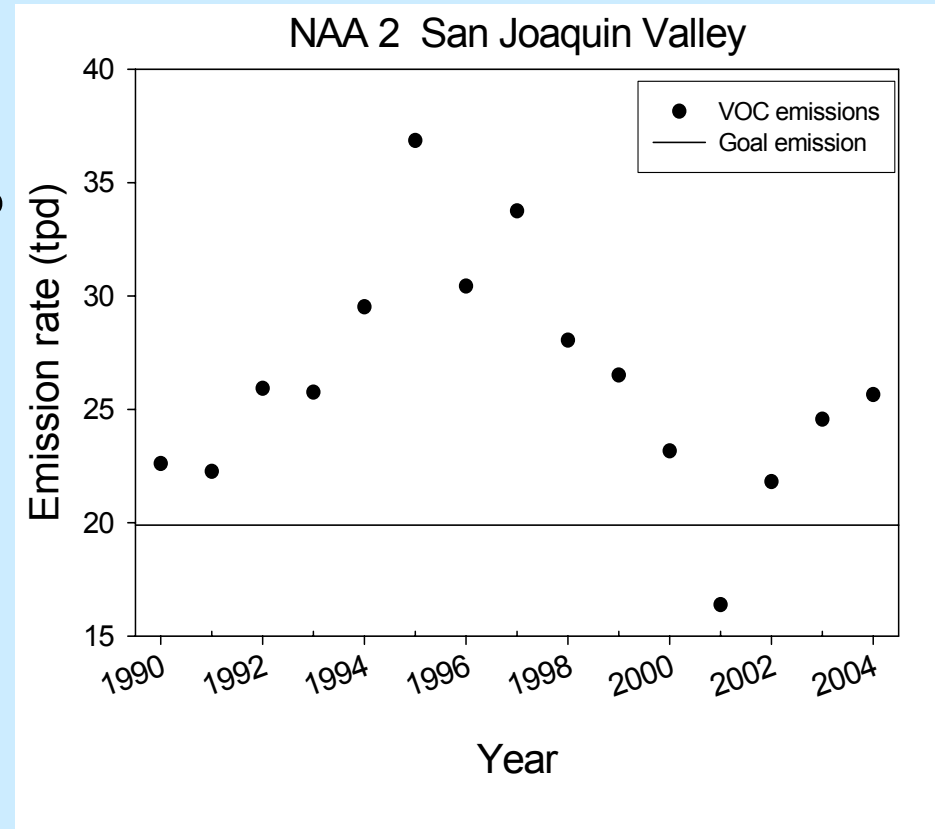
2004 Pesticide VOC Emissions in San Joaquin Valley Nonattainment Area

- Top “Primary” Active Ingredients (% of emissions)

- Metam (Vapam): 22%
- 1,3-D (Telone): 19%
- Chlorpyrifos (Lorsban): 11%
- Methyl bromide: 11%
- Dimethoate (Cygon): 2%

- Top Application Sites

- Carrots: 15%
- Almonds: 12%
- Cotton: 11%
- Oranges: 8%
- Outdoor nurseries: 7%



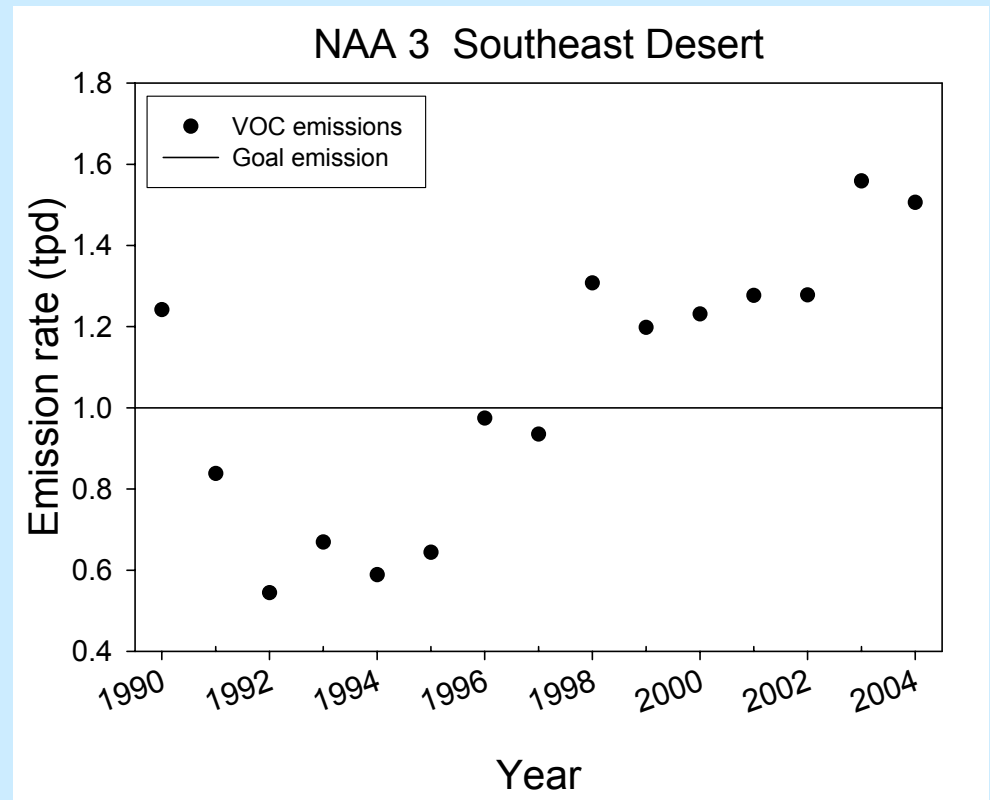
2004 Pesticide VOC Emissions in Southeast Desert Nonattainment Area

- Top “Primary” Active Ingredients (% of emissions)

- Metam-sodium (Vapam): 55%
- Methyl bromide: 22%
- 1,3-D (Telone): 3%
- Chloropicrin: 2%
- Permethrin: 2%

- Top Application Sites

- Uncultivated ag: 25%
- Peppers: 17%
- Carrots: 12%
- Strawberries: 11%
- Potatoes: 9%



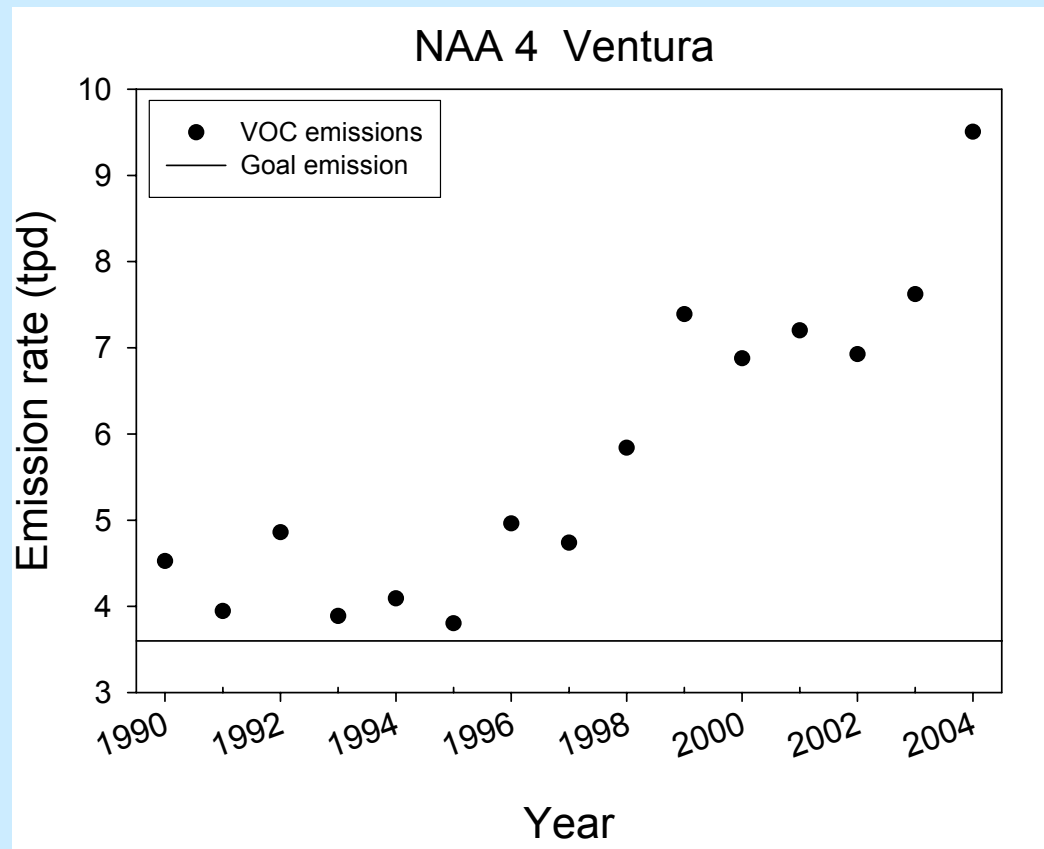
2004 Pesticide VOC Emissions in Ventura Nonattainment Area

- Top “Primary” Active Ingredients (% of emissions)

- Methyl bromide: 51%
- 1,3-D (Telone): 27%
- Chloropicrin: 11%
- Metam (Vapam): 5%
- Piperonyl butoxide: 2%

- Top Application Sites

- Strawberries: 74%
- Soil fumigation: 11%
- Tomatoes: 5%
- Lemons: 2%
- Flower nurseries: 1%



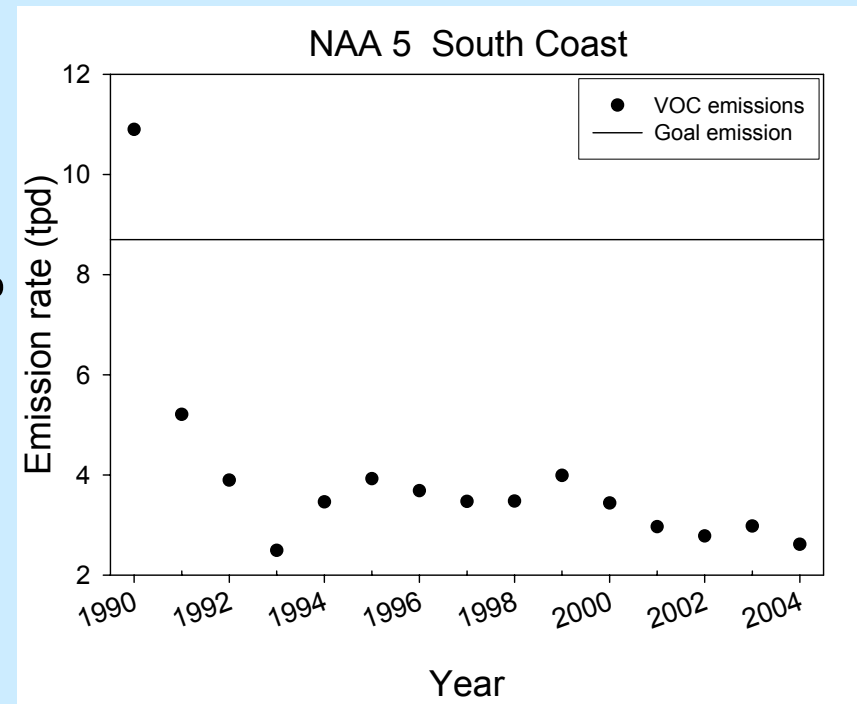
2004 Pesticide VOC Emissions in South Coast Nonattainment Area

- Top “Primary” Active Ingredients (% of emissions)

- Methyl bromide: 34%
- Permethrin: 13%
- 1,3-D (Telone): 13%
- N-Octyl bicyclo...(Pyrocidine): 7%
- Chloropicrin: 6%

- Top Application Sites

- Strawberries: 42%
- Structural pest control: 34%
- Fumigation, other: 7%
- Landscape maintenance: 5%
- Outdoor nurseries: 2%



Major Types of Pesticide VOCs (May-Oct 2004)

Nonattainment Area	Pesticide VOCs from Fumigants (%)	Pesticide VOCs from Emulsifiable Concentrates (%)
San Joaquin Valley	52	34
Southeast Desert	84	10
Ventura	93	3

Key Regulatory Issues

- DPR no longer meets the VOC reduction goals of the pesticide SIP for San Joaquin Valley
- Revised ozone standard requires overall VOC reductions beyond those required by the 1994 SIP
 - EPA revised ozone standard in 2004
 - New SIP required
- Exposure issues with fumigants
- Pesticide drift issues

Air Quality Initiative

- Reduce fumigant emissions
 - Regulations in 2007
- Reduce emulsifiable concentrate emissions
 - Reformulation decisions by 2006
- Reduce pesticide emissions through pest management improvements
- Adopt innovative technologies

Reduce Fumigant Emissions

- Regulations will include restrictions on application methods
- DPR is also considering
 - Applying regulations statewide (within and outside NAAs)
 - Requiring capture systems for commodity fumigation facilities
 - Requiring pest control businesses to employ controls as a condition of licensing
 - Requiring applicators to have a pest control operator license
 - Reducing seasonal exposure to methyl bromide

Reduce Emulsifiable Concentrate Emissions

- DPR initiated reevaluation to request **reformulation** of approx 780 liquid products
- Establishes a 20% emission potential goal
- Plans for reformulation due to DPR in March 2006
 - DPR proposed cancellation for 15 products for failing to respond to the reevaluation (7 products withdrawn)
 - DPR decisions for other products by end of 2006
- DPR considering VOC limit for new products

Reduce VOC Emissions Through Pest Management Improvements

- Long-term measures
- DPR is considering
 - Strategic partnerships
 - Pest-resistant and tolerant crops
 - Support of pest exclusion
 - Alternatives evaluation as part of restricted material permit process
 - Information driven pest management
 - Promotion of changes in commercially driven pesticide use (lenders, insurers, etc.)

Adopt Innovative Technologies

- Long-term measures
- Precision agriculture
 - Equipment designed to improve application efficiency and reduce waste (e.g. special nozzles)
 - Variable rate technologies that change the rate of application according to variations in field conditions
- Adoption
 - Create inventory of technology
 - Promote adoption through incentives and/or requirements

Non-Regulatory VOC Reduction Measures

- Increase adoption of Integrated Pest Management
- Avoid emulsifiable concentrates when possible
- Avoid applications between May and Oct when possible
- Use minimal application rates

Questions/Additional Information

Randy Segawa
Agriculture Program Supervisor
Department of Pesticide Regulation
(916) 324-4137
Email: rsegawa@cdpr.ca.gov

Web Page: www.cdpr.ca.gov
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